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A Revision of the North American Species of Fissidens.*—II.

CHARLES R. BARNES.

12. *F. polypodioides* HEDWIG: Musc. Frond. 3. 63. t. 27.

Hypnum polypodioides SWARTZ: Prod. 140.

Fissidens polypodioides HEDWIG: Musc. Frond. 3. 63. t. 27.—Sp. Musc. 154.—BRIDEL: Musc. Recent. II. 1. 141.—Sp. Musc. 1. 168.—Mant. Musc. 189.—Bry. Univ. 2. 695.—BEAUVOIR: Prod. 57.—SCHWÆGRICHEN: Suppl. I. 2. 8.—MUELLER: Syn. Musc. 1. 52.—SULLIVANT: Mosses U. S. 25.—Proc. Amer. Acad. 5. 273.—Icon. Musc. 42. t. 27.—LESQ. & JAMES: Man. 88.—MITTEN: Jour. Linn. Soc. 21. 559.

COLL.: DRUMMOND: Musci Amer. II. no. 38.—SULL. & LESQ.: Musci Bor. Am. 1 ed. no. 87.—2 ed. no. 110.

Dicranum polypodioides SWARTZ: Fl. Ind. Occ. 3. 1772.

Skitophyllum polypodioides DE LA PYLAIE: Desv. Jour. Bot. 6. 153. t. 38. f. 10.¹

Plants large, 2–5 cm., gregarious, yellowish-green: stems simple, rigid, rooting at base only, which is nearly bare: leaves numerous, scarcely imbricate, lance-oblong to linear-oblong, obtuse, entire or sub-denticulate near apex; border none; costa strong, barely reaching the apex; vaginant lamina $\frac{1}{2}$ – $\frac{2}{3}$ length; inferior lamina not narrowed, not at all or slightly decurrent, cells large, 16–24 μ , roundish, pellucid: flowers dioicous; the male in the lower axils; the female in the upper axils; archegonia numerous, without paraphyses: fruit sub-terminal; seta short, 1 cm. long, flexuous, reddish; capsule brown, obconic, much contracted under the large mouth when dry; teeth broad and long; operculum and thick sub-oblique beak equaling one half the length of capsule; annulus large, revolvable.

HAB.: Moist rocks: Louisiana (*Drummond*); Georgia (*Lesquereux*, sterile; West Florida (*Chapman*); Cuba (*Wright*).

13. *F. subbasilaris* HEDWIG: Sp. Musc. 155; t. 39. ff. 6–9.

MICHAUX: Fl. Bor. Am. 2. 299.—BRIDEL: Sp. Musc. 1. 169.—Mant. Musc. 189.—Bry. Univ. 2. 694.—SCHWÆGRICHEN: Suppl. I. 2. 10.—HAMPE: Linnæa 13. 45.—SULLIVANT: Mosses U. S. 25.—Icon. Musc. 41. t. 26.—MUELLER: Syn. Musc. 1. 50.—LESQ. & JAMES: Man. 88.—MITTEN: Jour. Linn. Soc. 21. 560.

COLL.: DRUMMOND: Musci Amer. I. no. 111.—II. no. 42.—SULLIVANT: Musci All. no. 184.—SULLIVANT and LESQUEREUX: Musci Bor. Am. 1 ed. no. 84.—2 ed. no. 107.—AUSTIN: Musci App. no. 105.

Skitophyllum subbasilare DE LA PYLAIE: Desv. Jour. Bot. 6. 163. t. 38. f. 11.

Plants small, 1–2 cm. high, densely and widely cespitose, green above, brown and tomentose below: stems simple or branched, erect: leaves 12–15 pairs, crisped when dry, oblong, obtuse with a single pointed cell at the apex, minutely crenate below, minutely and irregularly serrate above; border none; costa vanishing below the apex; vagi-

* Read before the A. A. A. S., Buffalo meeting, August, 1886.

¹Frequent mistakes are made in citing these plates. They are correctly numbered, but by a typographical error incorrectly referred to by De la Pylaie. There is also confusion in the paging of this monograph.

nant lamina $\frac{2}{3}$ – $\frac{3}{4}$ length; inferior lamina not tapering, ceasing before or at the base; cells small, 10–14 μ , roundish, densely chlorophyllose and very obscure: flowers dioicous?; female only known, arising near the base of the stem, rooting: fruit subbasal; seta short, equaling or somewhat exceeding the stems; capsule pale, cylindric-oval, erect, or slightly curved; conic operculum with its beak equaling half the capsule; calyptra slender, cucullate; spores 18–22 μ .

HAB.: On trees and rocks: Canada and states east of Mississippi river; St. Louis, Mo. (*Drummond*).

14. *F. taxifolius* HEDWIG: Sp. Musc. 135. t. 39.

BRAITHWAITE: Br. Moss-Fl. 1. 77. t. 12 A.—RICHARDSON: Append. 27.—SULLIVANT: Mosses U. S. 25.—JAMES: Trans. Am. Phil. Soc. 13. 109.—LESQ. & JAMES: Man. 87.—MITTEN: Jour. Linn. Soc. 21. 558.
COLL.: SULL. & LESQ.: Musci Bor. Am. 1 ed. no. 83.—2 ed. no. 106.—AUSTIN: Musci App. no. 107.

Plants of moderate size, 1–3 cm. high, gregarious, dark green: stems fasciculate branched at base, branches ascending or decumbent, radiculose: leaves numerous, closely approximate, sometimes slightly imbricate, crisped and incurved when dry, largest above the middle and decreasing toward the apex of stems, oblong-lanceolate, minutely serrulate, marginal cells often pellucid; border none; costa excurrent, broadening to form a strong mucro; vaginant lamina $\frac{1}{2}$ $\frac{2}{3}$ length; inferior lamina slightly narrowed to the base, not decurrent; cells hexagonal, 12–16 μ : flowers monoicous: male basal, on short rooting branches, antheridia 2 or 3, without paraphyses; female basal, axillary: fruit basal; seta 1–2 cm. long, flexuous, reddish-yellow; capsule oblong, thick, sub-turgid, cernuous, or when empty pendent and contracted below the mouth, dark brown; operculum with a long slender beak commonly bent near the base; calyptra cucullate; spores 18–22 μ .

HAB.: Shaded clayey ground: Canada and states east of Mississippi river; southern Missouri (*Engelmann*).

15. *F. floridanus* LESQ. & JAMES: Proc. Amer. Acad. 14. 137.

Manual 83.—MITTEN: Jour. Linn. Soc. 21. 556.

Plants 1–3 cm. high, brown below, bright green above: stems sparingly branched from the base: leaves densely crowded, the upper larger, long cultriform; apex minutely erose-denticulate, otherwise entire; border broad, pale; costa strong, vanishing a little below the apex; vaginant lamina more than $\frac{1}{2}$ length; inferior lamina ceasing abruptly at the base; cells minute, hexagonal: flowers monoicous: the male terminal on somewhat elongated lateral branches; the female axillary near the middle of the stem: fruit on a short branch rooting at base, single (rarely two from the same stem); seta 10–15 mm. long, thick, reddish; capsule oblong-oval, cernuous; operculum large, long-beaked.

HAB.: Florida (*Garber*).

16. *F. decipiens* DE NOTARIS: Epil. Bry. Ital. 479.

BRAITHWAITE: Br. Moss-Fl. 1. 76. t. 11 D.—LESQ. & JAMES: Manual 87.

F. adiantoides MITTEN: Jour. Linn. Soc. 21. 559, *not Hedwig!*

COLL.: DRUMMOND: Musci Amer. I. no. 110.—II. no. 41, as var. *marginatus* of the next.—

SULLIVANT: Musci All. no. 178.—SULL. & LESQ.: Musci Bor. Am. 1 ed. no. 85.

Plants of medium size, 1–3 cm. high, dusky green, gregarious: stems simple or branched at base: leaves as in *F. adiantoides* but closely imbricate; border 4 or 5 cells wide, usually very distinct, pellucid; cells small and indistinct, 8–12×8–16 μ : flowers dioicous, on plants in different tufts; the male axillary, gemmiform; female terminal: fruit as in *F. adiantoides*, but seta short, not much exceeding the stems, and spores 16–24 μ , mostly 20 μ .

HAB.: On sandy soil and rocks; common in Canada and the Eastern States: Columbia river (*Drummond*).

17. *F. adiantoides* HEDWIG: Musc. Frond. 3. 61. t. 26.

BRAITHWAITE: Br. Moss-Fl. 1. 78. t. 12 B.—MITTEN: Jour. Linn. Soc. 8. 29.—LESQUE

REUX: Mem. Cal. Acad. 1. 8.—LESQ. & JAMES: Man. 88.

COLL.: AUSTIN: Musci App. no. 106.

F. majus MITTEN: Jour. Linn. Soc. 21. 559.

Plants medium or large, 2–10 cm. high, gregarious: stems erect, branching above or below, branches rooting: leaves numerous, imbricate at base, oblong-lanceolate, abruptly acuminate, minutely and regularly serrulate, becoming irregularly serrate with large and small teeth towards the apex; border none (var. *immarginatus*) or of two or three rows of thick-walled, more or less pellucid cells; vaginant lamina $\frac{1}{2}$ length or more; inferior lamina reaching the base; vertical lamina crisped at tip when dry; cells large, roundish-hexagonal, distinct, 16–20 μ , 24–32 μ in sterile shoots: flowers monoicous, short stalked near the middle of stems; the male gemmiform, below the female: fruits median, 1–several on the same stem; seta 1–2.5 cm. long, yellowish-red, flexuous; capsule oblong, yellowish or dark red, much narrowed under the orifice when empty; operculum and long more or less oblique beak equaling the capsule; spores 22–24 μ .

HAB.: Shady, moist places; common in Canada and Eastern States; Fort Colville (*Lyal*); California.

18. *F. grandifrons* BRIDEL: Sp. Musc. 1. 170.

BRIDEL: Mant. Musc. 191.—SCHWÆGRICHEN: Suppl. I. 2. 11.—BRUCH & SCHIMPER: Bry.

Eu. Fiss. Monog. 11. t. 106.—SULLIVANT: Mosses of U. S. 25.—MUELLER: Syn. Musc.

1. 46.—SCHIMPER: Syn. Musc. 1 ed. 110.—2 ed. 121.—LESQUEREUX: Mem. Cal. Acad.

1. 8.—BOLANDER: Cat. 37.—WATSON: Bot. Calif. 2. 374.—MITTEN: Jour. Linn. Soc.

8. 29.—1. c. 21. 559.—LESQ. & JAMES: Man. 89.

COLL.: SULLIVANT: Musci All. no. 186.—SULL. & LESQ.: Musci Bor. Am. 1 ed. no. 88.—

2 ed. no. 111.—AUSTIN: Musci App. Suppl. no. 483.

Skitophyllum congestum DE LA PYLAIE: Desv. Jour. Bot. 6. 164. t. 39. f. 16.

[*Fissidens subgrandifrons* MUELLER: Bot. Zeit. 22. 359.

Fissidens insignis SCHIMPER (in herb. HAMPE): Bot. Zeit. 1. c.

Fissidens strictus SCHIMPER.—Fide MITTEN: Jour. Linn. Soc. 21. 559.]

Plants of variable size, but usually very large, 3-15 cm. high, dark green, gregarious or cespituose: stems pale, fasciculately branched at base, branches simple or again branched, rigid: leaves numerous, all equal, thick, rigid, linear-lanceolate, entire; border none; costa thick, pellucid, vanishing just within the apex; vaginant lamina more than $\frac{1}{2}$ length; inferior lamina not narrowed; cells in several layers, small, 12-16 μ : flowers axillary; archegonia numerous: fruit lateral, from the upper axils; seta long; capsule erect or oblique, oblong, dark red-brown; teeth inserted far within the edge, deeply cleft, very broad at the irregular and sparsely perforate base, closely articulate, the divisions subulate, rough; operculum conic rostrate, beak short, often oblique; spores somewhat oval, 20-28 \times 28-32 μ .

HAB.: On submerged or wet rocks: New York, Chittenango Falls (*Barron*), Syracuse (*Rust, Cook*), Caledonia creek (*Clinton*), Niagara Falls; Owen Sound, Canada (*Macoun, Roy*); Ohio (*Sullivan*); Illinois (*Wolf, Brendel*); south eastern Missouri (*Wolf*); Ruby Valley, Nevada (*Watson*); California (*Bigelow, Bolander, Roy*).

19. F. Julianus SCHIMPER: Flora 21. 271.

MUELLER: Syn. Musc. 1. 44.—MITTEN: Jour. Linn. Soc. 21. 560.

Fontinalis Juliana SAVI: Fl. Pis. 2. 114.¹—DE CANDOLLE: Fl. Franç. 6. 236.—POLLICH Fl. Veron. 3. 385.—DUBY: Bot. Gall. 554.

Skitophyllum fontanum DE LA PYLAIE: Desv. Jour. Bot. 6. 158. t. 34. 2.

Otodiceras Julianum BRIDEL: Bry. Univ. 2. 678.—BRUCH & SCHIMPER: Bry. Eu. Oct. Monog. 4. t. 108.

Conomitrium Julianum MONTAGNE: Ann. Sci. Nat. II. 8. 246. t. 4.—MUELLER: Syn. Musc. 2. 524.—SCHIMPER: Bry. Eu. Corol. 22.—Syn. Musc. 1 ed. 111.—2 ed. 122.—SULLIVANT: Mosses U. S. 25.—PECK: 19th Rept. 46.—LESQ. & JAMES: Man. 89.

COLL.: SULL. & LESQ.: Musci Bor. Am. 1 ed. no. 89.—2 ed. no. 112.—AUSTIN: Musc App. no. 187.

Fissidens Dillenii HAMPE: Linnæa 13. 45.

Plants large, slender, 5-15 cm. long, floating, the older parts blackish-green: stems filiform, branching by innovations along their whole length: leaves numerous, remote, linear-lanceolate, entire; border none; costa vanishing at some distance from the apex; vaginant lamina $\frac{1}{4}$ length; inferior lamina not reaching the base; cells irregular, hexagonal, inclining to quadrate below, 16-20 \times 20-32 μ : flowers monoicous, terminating very short axillary branches; the male sometimes clustered, antheridia 2-3; the female rarely on elongated branches, archegonia 3-5, vertical lamina of perichætil leaves ceasing just below apex of vaginant lamina: fruit cladogenous, often numerous; seta shorter than the capsule, fragile at base, pale; capsule elliptical, pale, red at mouth; teeth short, premorse, irregularly cleft and perforate above the middle, yellowish, pellucid; operculum conic-rostrate, together with its blunt beak equaling the capsule; calyptra conic, nearly black, cleft or erose at base, covering only the beak; spores 20-24 μ .

¹ This reference I have not been able to verify. The page is quoted by De Candolle as 414.

HAB.: On wood and stones in streams and swamps: Rhode Island (*Bennett*); Hampden, Conn. (*Eaton*); Shawangunk Mts., N. Y., Northern N. J. (*Austin*); Smoke's creek, N. Y. (*Clinton*); Columbus, O. (*Sullivant*); Santee Canal, S. C. (*Ravenel*); Savannah river (*Beyrich*); Roseville, Fla. (*Austin*); Rocky Mts. and California (*Hall*).

20. F. Hallianus MITTEN: Jour. Linn. Soc. 21. 560.

Conomitrium Hallianum SULL. & LESQ.: Austin's Musci App. no. 108.—SULLIVANT: Icon. Musc. Suppl. 43. t. 28.—LESQ. & JAMES: Man. 90.

Plants small, slender, 1-3 cm. long, in small, dirty-green tufts: stems filiform, fasciculately branched at base: leaves remote, numerous, narrowly linear-lanceolate; inferior lamina descending almost or quite to the base; cells 16-24 μ ; otherwise as in the preceding: flowers monioicous, terminal on rather elongated, leafy branches: fruit cladogenous; seta once and a half or twice as long as the capsule, pale; capsule oblong-elliptical, pale; teeth undivided, lance-subulate, reddish; distantly articulate, papillose, inserted below the edge; operculum conic-rostrate, together with its acute beak shorter than the capsule; calyptra cucullate, covering entire operculum; spores 18-24 μ .

HAB.: On wood and stones in swamps and rivulets, places wet by spray, and old wells: Athens, Ills. (*Hall*); Little Falls and Ogdensburg, N. J., and Herkimer county, N. Y. (*Austin*); Caloosa, Fla. (*J. D. Mnell Smith*).

REMARKS.

F. bryoides.—The teeth in this species and its congeners are somewhat spirally roughened above. The stems bearing their first fruit do not bear any male flowers: at the second fruiting the male flowers are abundant in the axils of the older leaves.

F. bryoides, var. *cæspitans*.—I have seen no American specimens of this variety.¹ The rufous purple rhizoids and pale color are its most striking characters. These differences, together with the robust habit, are just such as we should expect on transferring the species to wet places, and do not seem to me sufficient basis for the new species proposed by Mitten.

F. Closteri.—"The plants are always surrounded by brown patches of protonema, the color of which and general appearance is characteristic."—Austin, *fide* E. A. Rau in *lit*.²

¹Mr. Allen writes: "We collected it (with very immature fruit) on the stream which comes down from Boott's spur, * * * just south of the stream from Tuckerman's Ravine." The specimens sent to James can not now be found in his herbarium, nor can Prof. O. D. Allen find his own.

²ERRATUM.—Page 5, line 4: for "on the ground" read *on rocks along rivulets*.—E. A. RAU.

F. incurvus.—Braithwaite cites “Starke MSS.” as authority for this name. But Schwægrichen first *published* it in 1811. From his plate, which has in this part no explanatory text, Röhling took up the name in Deutschl. Fl. 3. 76 (1813). The papillæ of the teeth in *F. incurvus* and its allies are not arranged spirally as in the bryoides group, but are irregularly distributed.

This species has two distinct forms which differ chiefly in the capsule. The typical form has an arcuate capsule, while the *f. erectus* has the capsule erect. The latter is especially abundant in the James herb. from all parts of the middle Atlantic States. The variety *minutulus*, in its typical form, is readily distinguished by its small size and narrow, wavy-edged leaves. It passes insensibly however on the one hand into the variety *exiguus*, and on the other into true *incurvus*. The inflorescence in the whole group is variable and can not be depended upon for specific distinctions.¹ In specimens of *minutulus* from Oakland, Md., I have found the old plants innovating from the upper axils. These innovations are the male and female stems, and arise side by side from the same point with their rhizoids interlaced. In other specimens the male was found attached to the female exactly as in typical *incurvus*. In some of these specimens the leaves are margined, in others they are immarginate, and in others still some leaves are margined, and some not, apparently as it happened.

F. Garberi.—I have examined many flowers of this species, but have found none with antheridia. I therefore alter the description of the flowers to conform to Austin’s investigations and my own.

F. Donnellii.—This plant has been collected but once, without capsules, and ought probably to be referred to *F. subcrenatus* of Schimper, a Mexican species, from which its known characters differ only by the less number (by one pair) and greater narrowness of the leaves. The larger cells and the distinct serration of the leaves are obvious distinctions from *F. Garberi*, to which it is closely allied.

F. obtusifolius.²—“Specimens from Texas appear to be pseudo-monoicous, *i. e.*, a branch with a terminal male flower is at first attached to the female stem, and afterward becomes independent, rooting at base.”—*Mss. note in herb. Sullivant.*

¹Cf. Braithwaite: Br. Moss-Fl. i. 66.

²To habitat on page 7 add: Colorado (*Brandege*) *fide* Rau.

F. rufulus.—The upper leaves are usually much abraded ; of some, the thick borders and costa alone remain.

F. Floridanus.—This species has been severely criticized by Austin,¹ and no specimens of it are extant in this country.

F. decipiens and **F. adiantoides.**—I can not agree with Mitten² in changing the application of Hedwig's name. The characters which distinguish *adiantoides* from *decipiens* are stature, size of leaf-cells, character of leaf-border, monoicism and habitat. Of these Hedwig mentions but one, and that one about which it was easy to be mistaken by reason of the scarcity of male flowers. If indeed he had both specimens he merely confused them (as many subsequent writers did), as is shown by his citing Dillenian and Linnæan figures and descriptions of the palustral species under his description, "*femineus itidem alaris proprii individui.*" As the only Hedwigian character is somewhat in doubt, it seems unwise and unnecessary to introduce confusion by transferring Hedwig's name from a plant with which it has been associated for a century to a plant which it is possible, but not proved, that he meant.

F. grandifrons.—The description of the fruit is supplied from Himalayan specimens collected by Falconer.

DOUBTFUL OR EXCLUDED SPECIES.

F. impar Mitten: Jour. Linn. Soc. 21. 554.—*F. bryoides* Drummond: Musci Am. No. 113 in part.

"Similar to small *F. bryoides*, but with more oblong leaves, having shorter and wider points, the inferior edge of the vertical lamina not continued to the base, mostly only half way ; limb very narrow or almost obsolete on the vertical lamina ; capsule oval or oblong ; male flowers bud-like, very minute.

"Canada, Prof. Macoun."

I have examined this plant in Drummond's collection, in which it is recognizable. I have not been able to find it, however, in collections kindly loaned by Prof. Macoun. It seems to me to be only depauperate *F. bryoides*.

F. inconstans Schimper.—This form seems to be a mere sport of *F. incurvus*, dependent on the decaying or not of the older stems. To the latter species it is reduced.

¹Bull. Torr. Bot. Club, vii. 6.

²Jour. Linn. Soc. xxi. 539.

F. synoicus Sullivant: Mosses U. S. p. 103.—Referred by Lesquereux and James to *F. inconstans*, must be reduced to *F. incurvus*. The variability of the inflorescence seems to be only a sport as in *F. inconstans*. It is nearest the var. *minutulus*.

F. Hallii Austin: Bot. Gaz. 2. 97.—Lesq. and James: Man. 85.—Mitten: Jour. Linn. Soc. 21. 558.

“Size and facies of *F. incurvus*, from which it is distinguished by the crenulate leaves without a border, the (always?) longer-beaked operculum, the calyptra not cleft and descending scarcely to the base of the beak, etc.—Capsule erect, pedicel moderately long, inflorescence dioicous, plants of both sexes growing together.—Texas, *Hall*.”

The above characters are, in the *incurvus* group, wholly insufficient. The scanty diagnosis does not permit it to be referred with certainty to any species. It is probably *F. incurvus*, var. *exiguus*. In case it proves, on further collection, to be a good species, it should be called *F. Austini*, as the present name is too near *F. Hallianus*.

F. Texanus Lesquereux: Lesq. & James Man. 86.—Mitten: Jour. Linn. Soc. 21. 556.

“Plants dark green, turning to black: leaves 5–7 pairs, curved at the apex, broadly lanceolate-acuminate, with a thick dark smooth margin ascending to the apex or to near the slightly serrulate point: costa stout, percurrent or excurrent into a short mucro; dorsal lamina broad, descending to the base: male and female plants similar: capsule long-pedicellate, oval, inclined, rarely erect, greenish brown, smooth; lid conical, short-beaked, subincurved.—Herb. Sulliv. 1850. Texas (*Wright*).”

Neither MSS. nor specimens can now be found in the Sullivant herbarium, and the meager description indicates too close affinity with *F. incurvus*, and it can hardly be doubted that it is referable to this polymorphous species. The remark of Lesq. & James that “it differs from *F. Hallii* merely in the entire margined leaves” also indicates that it is not a true species.

F. crassipes Wilson.—No American specimens are known.